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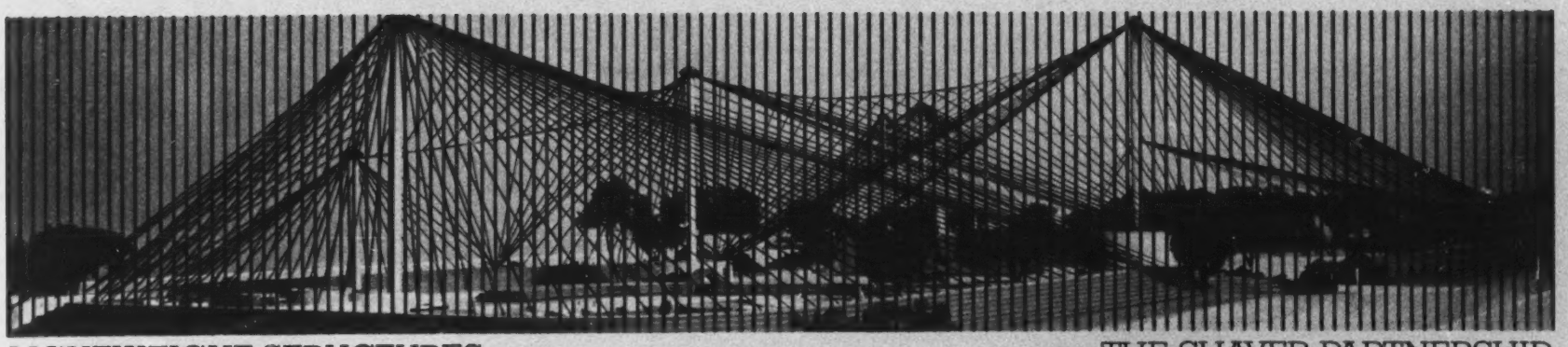
ABSTRACT

One of the newest and most promising developments in architecture has been the use of lightweight structures for encapsulating space. Using this new technology, builders can enclose large and small areas at a fraction of the cost of conventional construction and at the same time provide interior space that is totally flexible. This brochure shows some of the ways in which this new technology has been used for educational facilities. (Photographs may reproduce poorly.) (Author)



LIGHTWEIGHT STRUCTURES

THE SHAVER PARTNERSHIP

SALINA, KANSAS
MICHIGAN CITY, INDIANA

ED 064755

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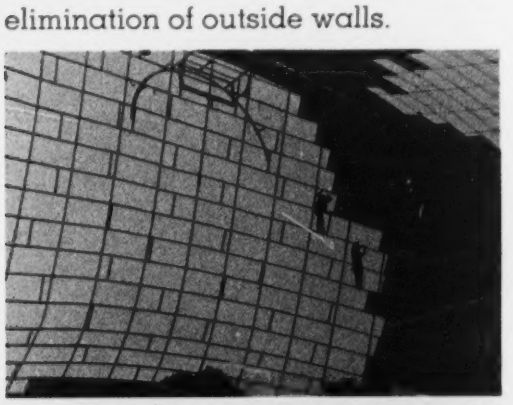
EA 004 326

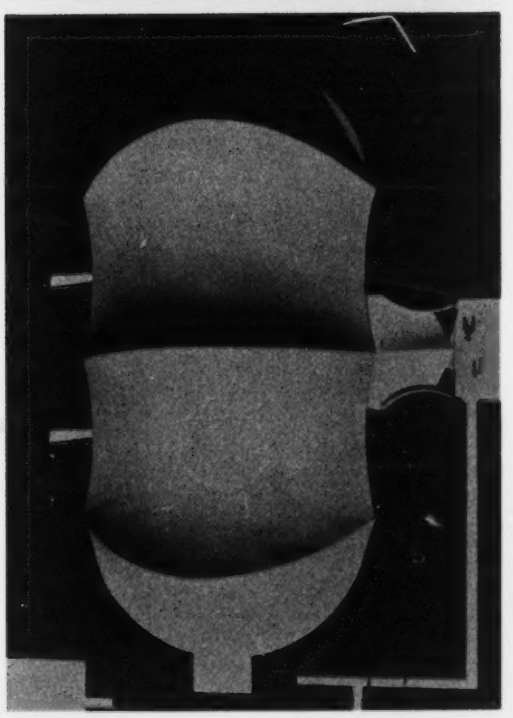
One of the newest and most promising developments in architecture has been the use of lightweight structures for encapsulating space. Using this new technology, we can enclose large and small areas at a fraction of the cost of conventional construction, while at the same time providing interior space that is totally flexible.

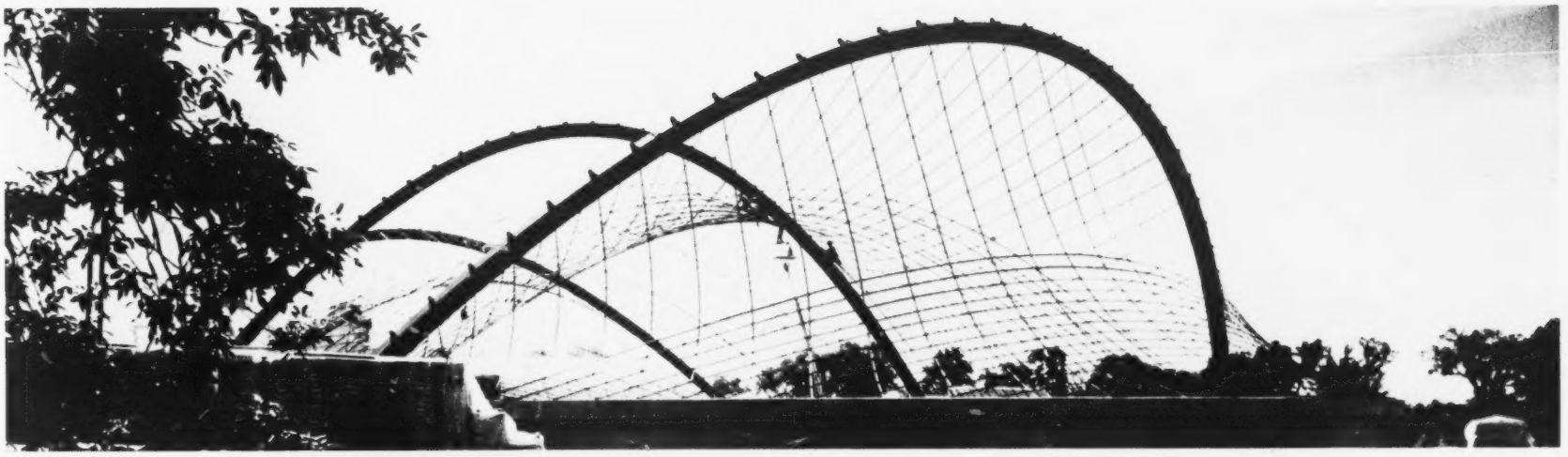
The Shaver Partnership has been deeply involved in the research and development of lightweight structures over the past 10 years. During this decade, the concept of lightweight structures has moved into the forefront of architectural design. This brochure shows some of the ways in which The Shaver Partnership has used this new technology to serve the interests of its clients.

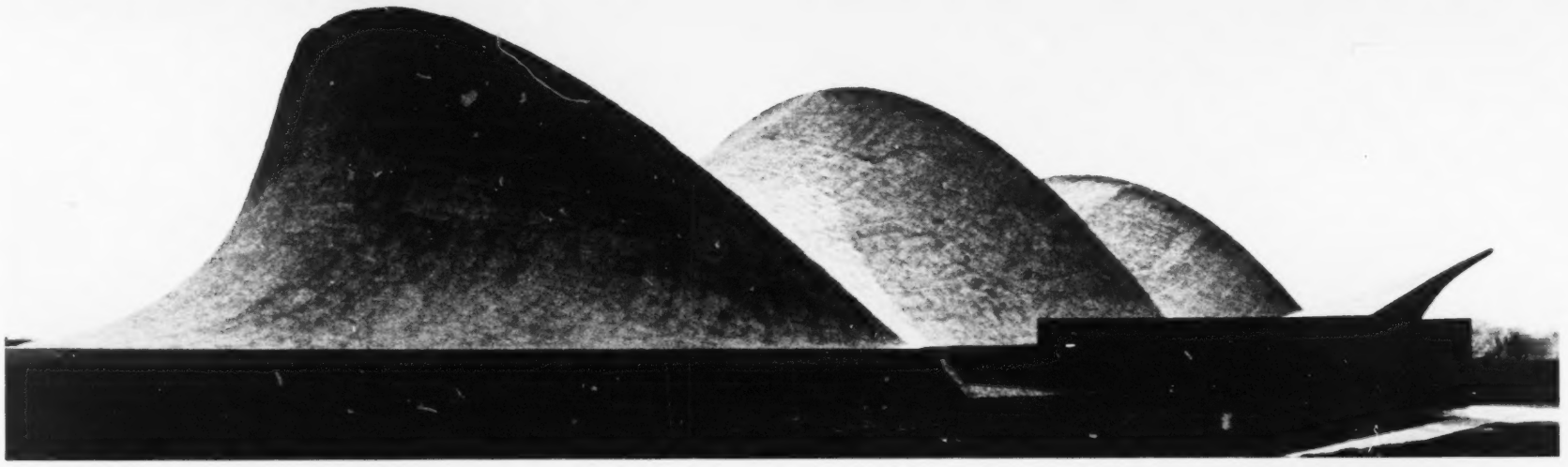
The Eugene Closson Physical Education Facility of Graceland College, Lamoni, Iowa, is one example of the successful use of a lightweight structure to solve a specific problem. The college needed a fieldhouse that would allow it to carry on a wide range of physical education functions and would provide it with facilities for intercollegiate sports.

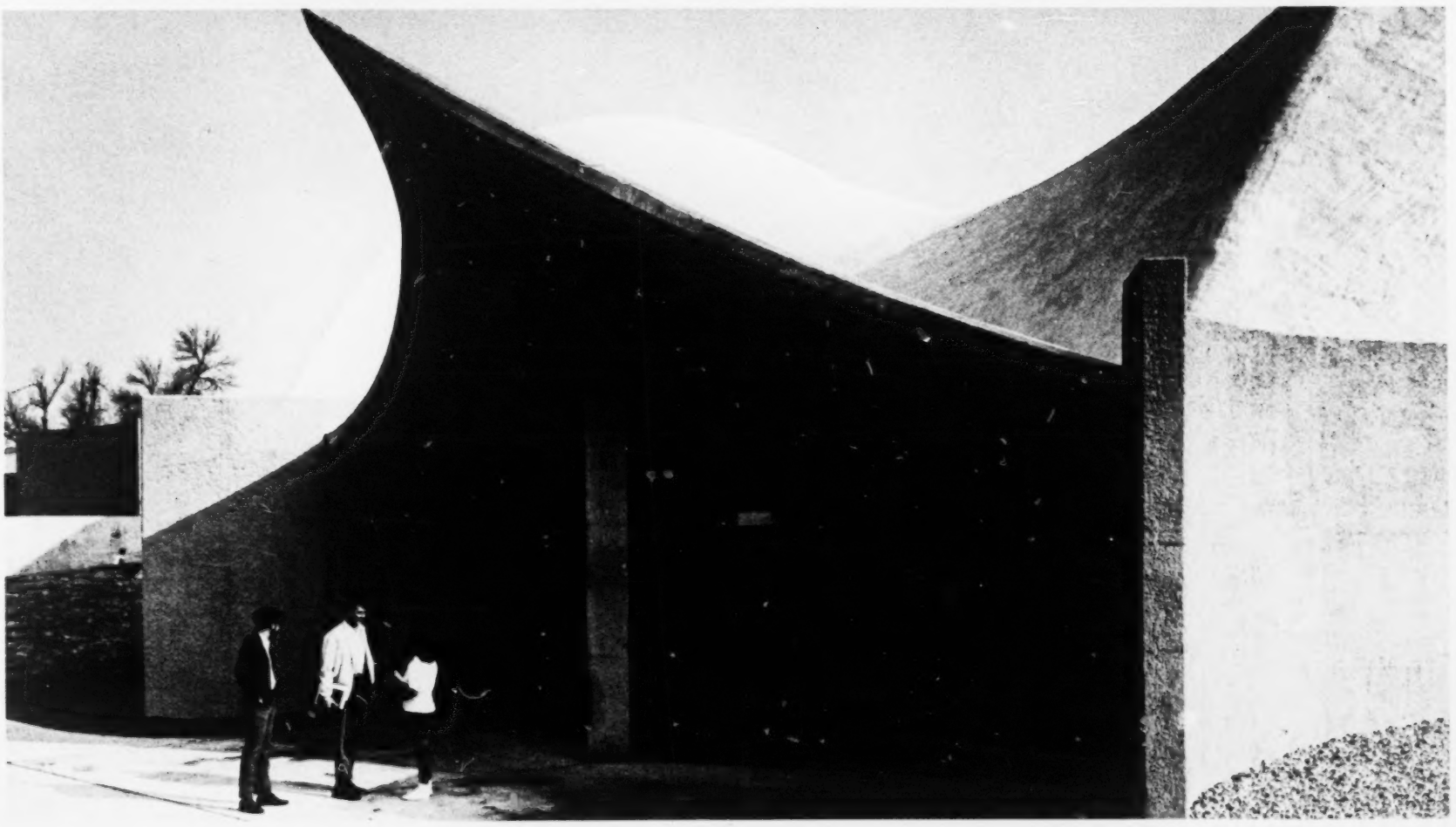
The fieldhouse designed by The Shaver Partnership utilizes lightweight technology to enclose an acre of space. The structure itself is formed by three hinged arches covered with a lightweight membrane of steel cables, fiberglass and urethane foam. The column-free building is 305 feet long, 174 feet wide and has a height of 70 feet. The weight of the structure was directly responsible for reducing costs. Another economy was the virtual elimination of outside walls.

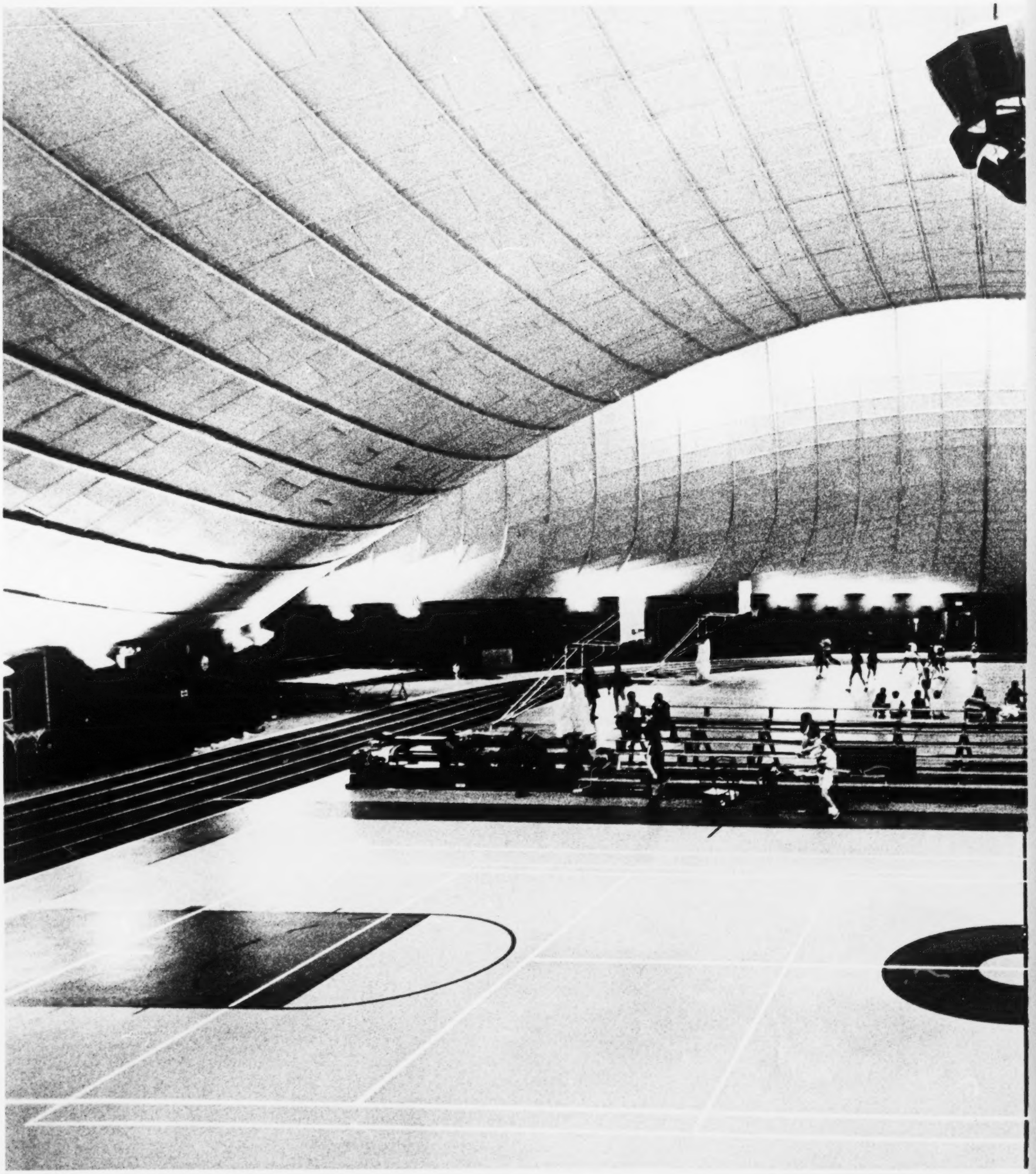


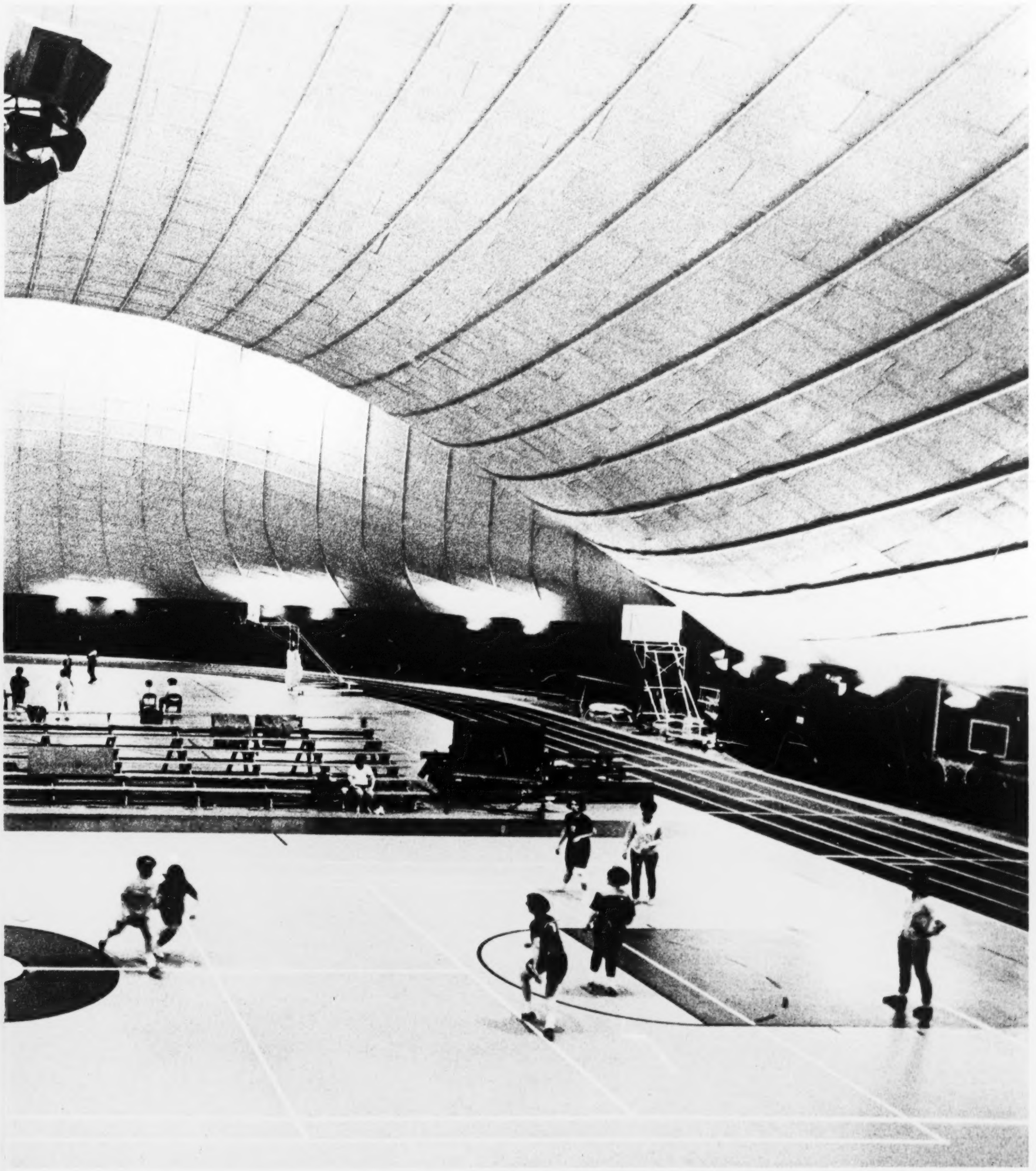




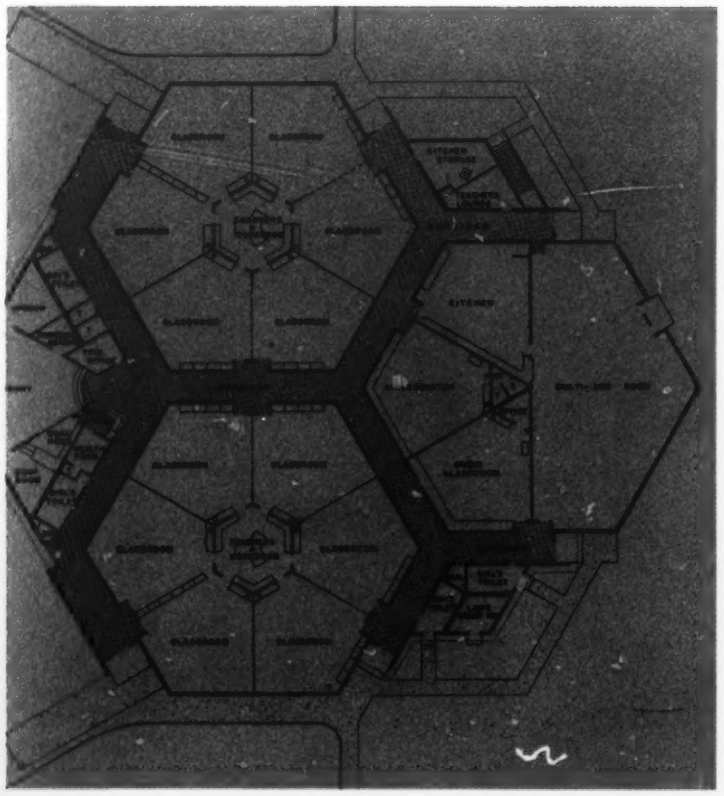








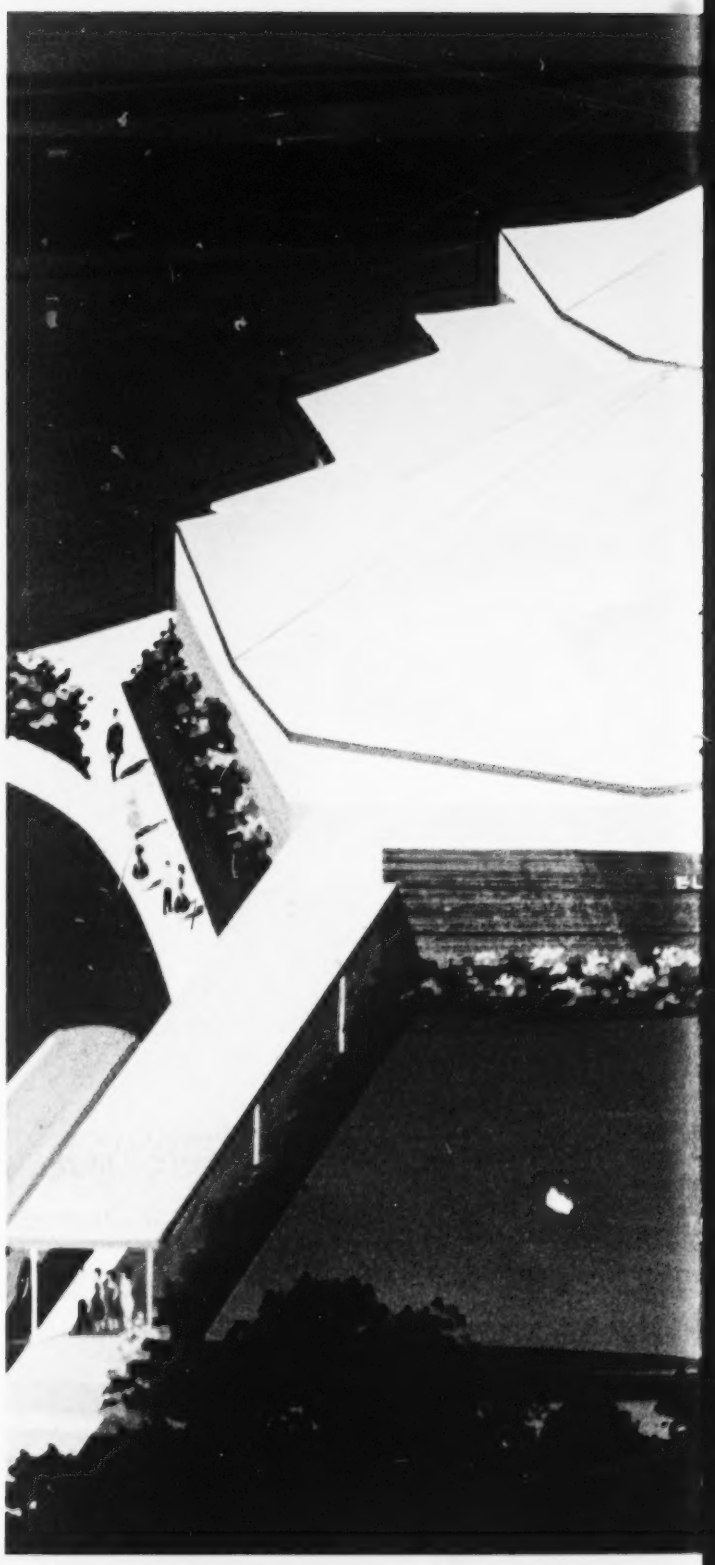
Billowing catenary forms aid the acoustical control while providing height for a variety of activities. Tennis, volleyball, badminton, football, baseball, basketball, track and field and a host of lifetime sports can all be carried on in the huge Graceland fieldhouse.

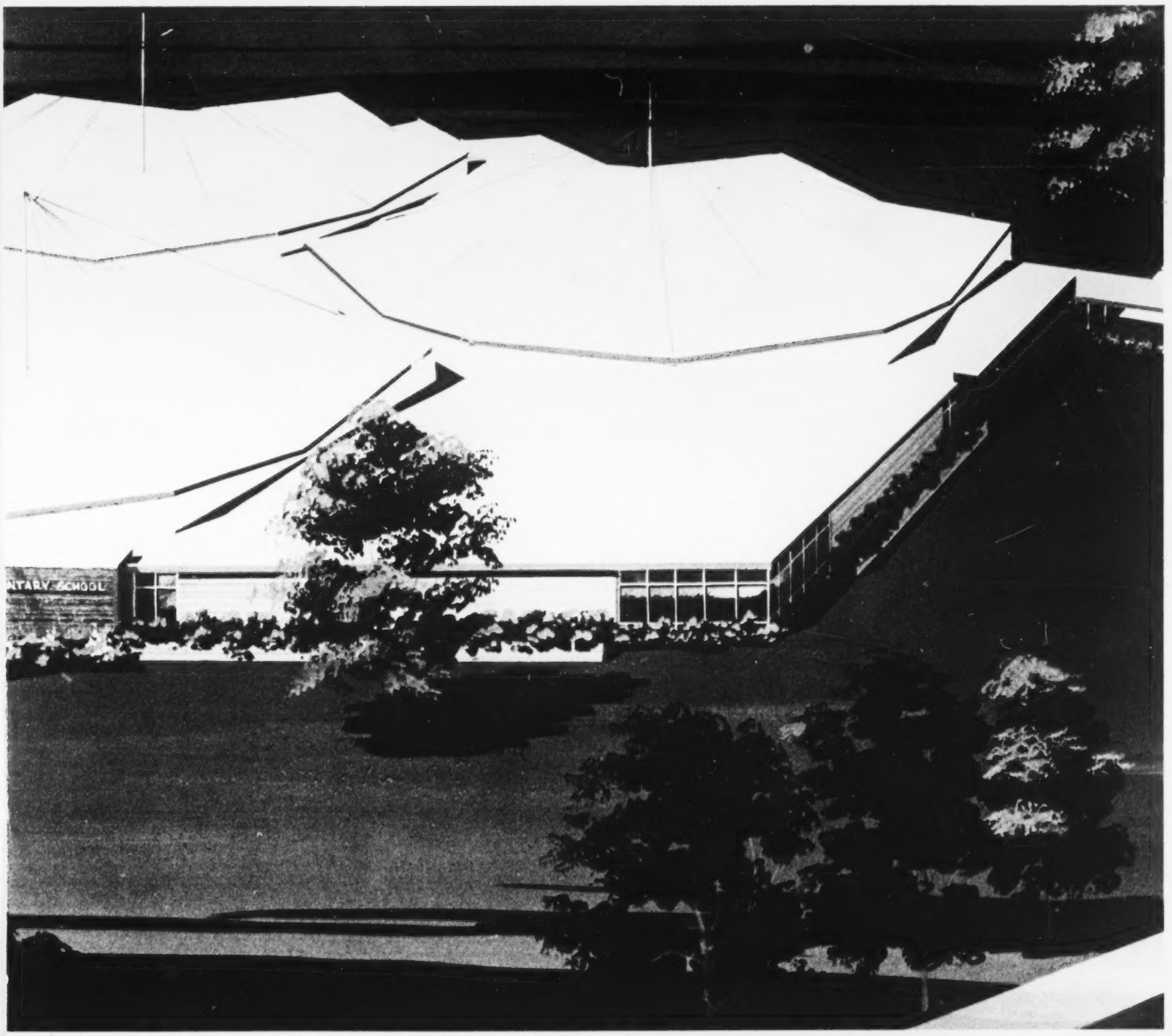


East Memorial Elementary School. By using a lightweight structure for this project in Greeley, Colorado, The Shaver Partnership was able to design a school with total interior flexibility.

Steel cables suspended from each of three masts support the full weight of the roof, leaving the interior free of supporting walls and columns. The interior of the school can be removed and rebuilt without affecting the building's structure. Such flexibility is virtually impossible to attain with conventional construction techniques.

While economy was not the prime consideration in designing this school, the fully air-conditioned building was less expensive than conventional schools built in the same district several years earlier.

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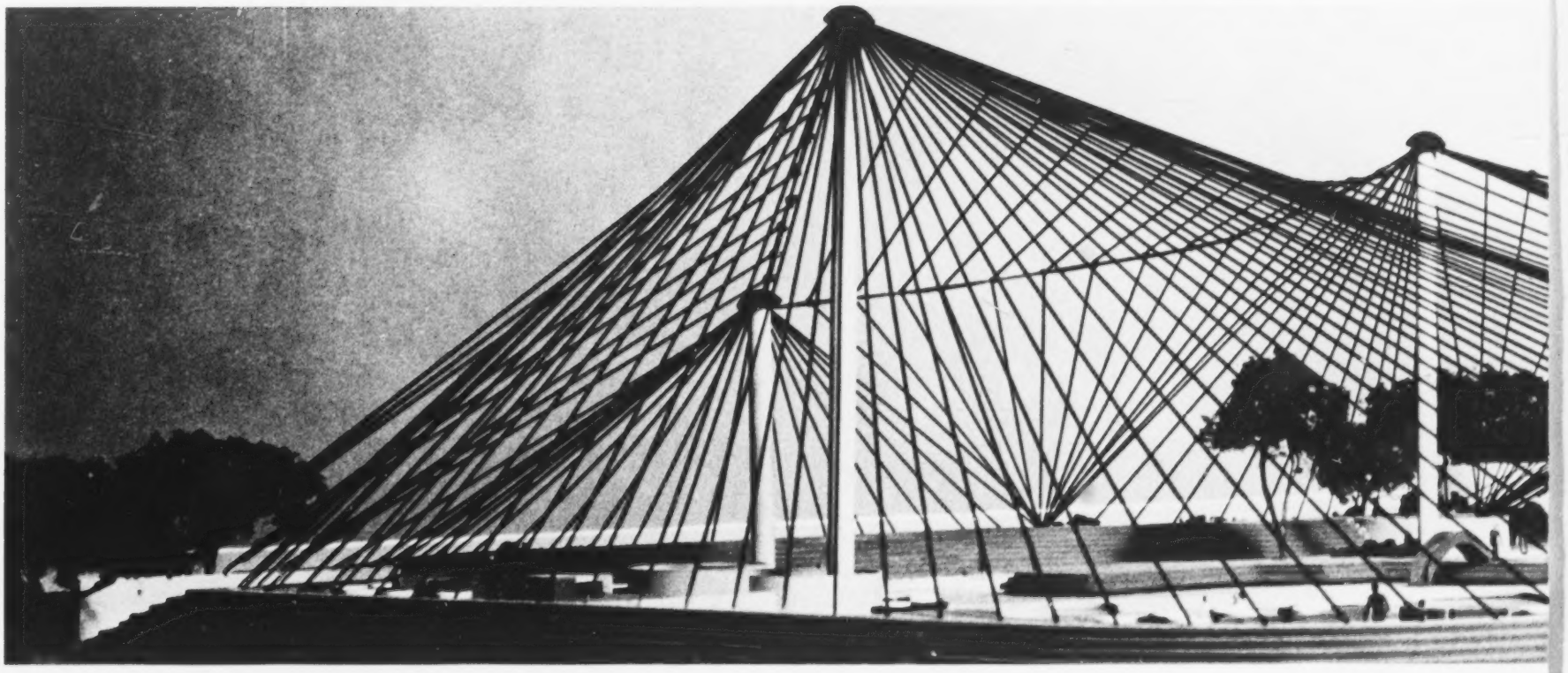
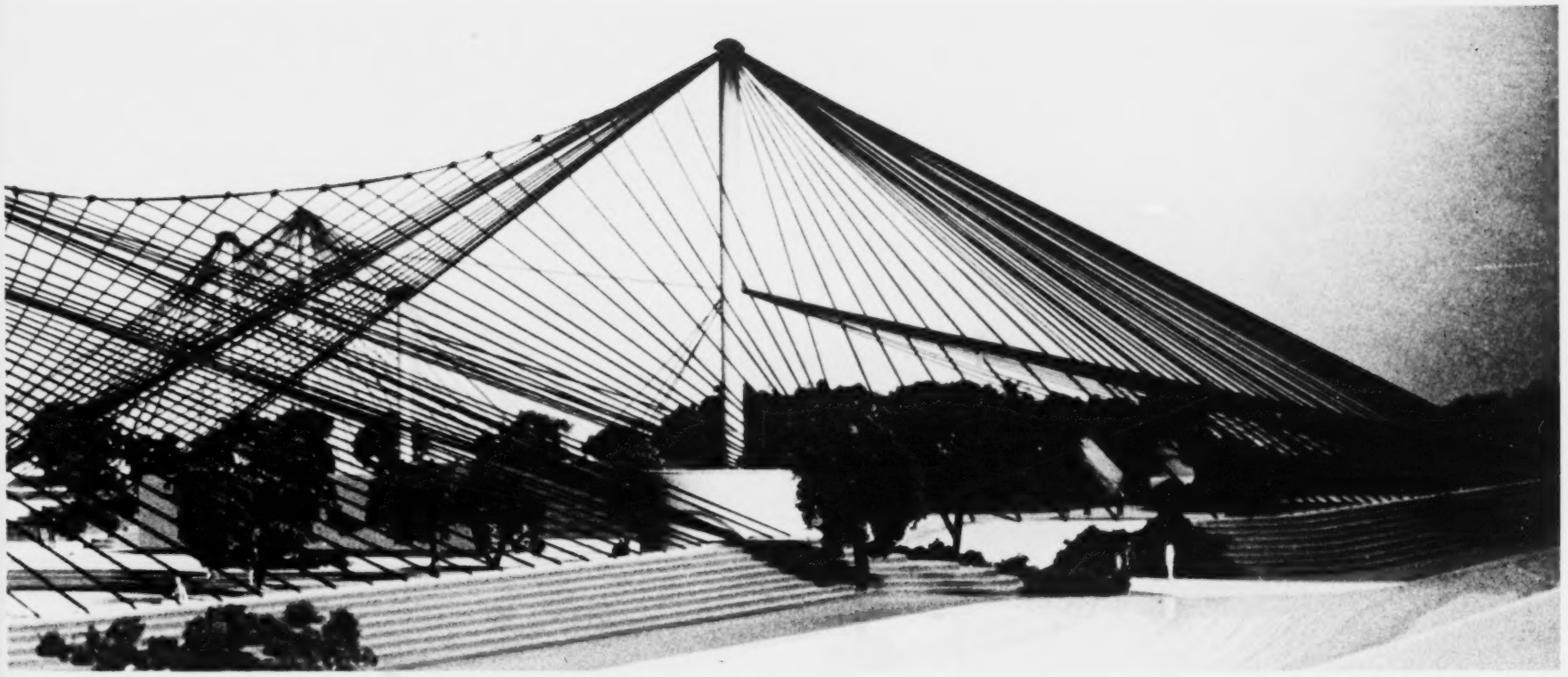


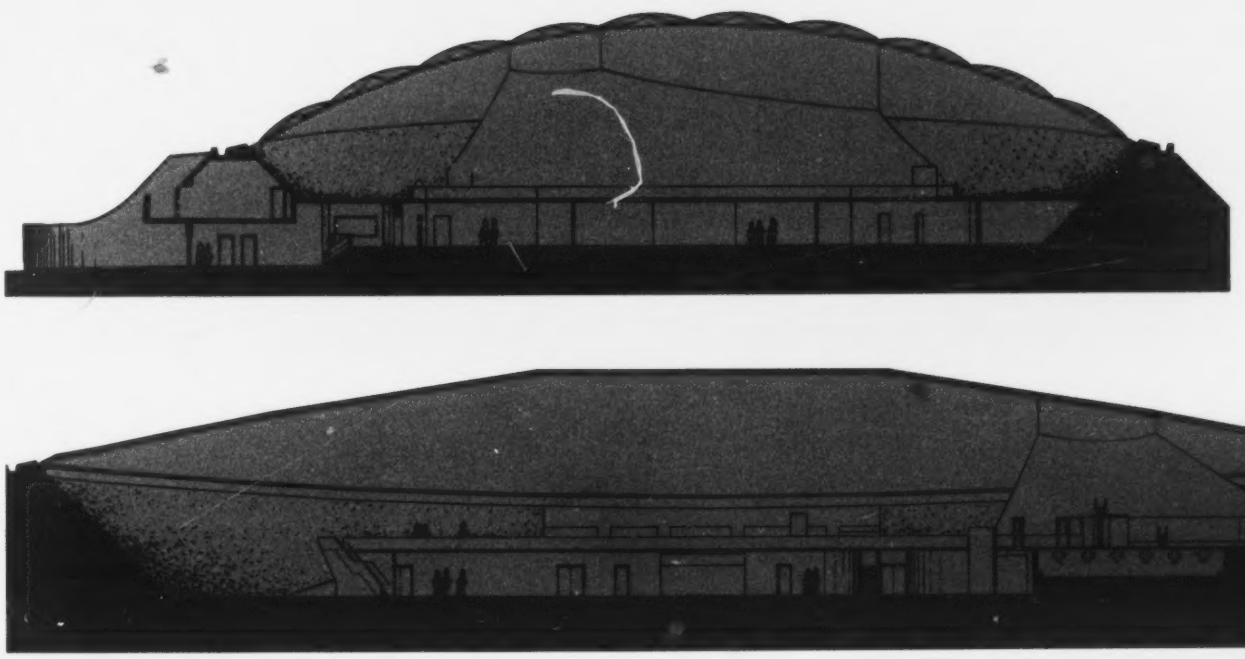
La Verne College Student Center. The design challenge was to provide a student center for a fraction of the cost of a traditional campus building. The answer: a lightweight structure. Sixty-seven thousand square feet of usable space is being enclosed for the La Verne, California, institution by a canopy of woven fiberglass and Teflon over stretched steel cables. The cables spring from earth berms and concrete compression rings which form the structure's walls.

The interior was arranged as a "village street" down which students might walk and which would provide them with a number of attractions. Among these are a 200-seat theatre, physical education facilities for team and lifetime sports, instructional areas for fine arts, student government offices, a snack bar and cafeteria, a book store, a health clinic, a post office and a number of leisure areas for informal activities. Display areas for student and professional work are also provided under the lightweight roof.

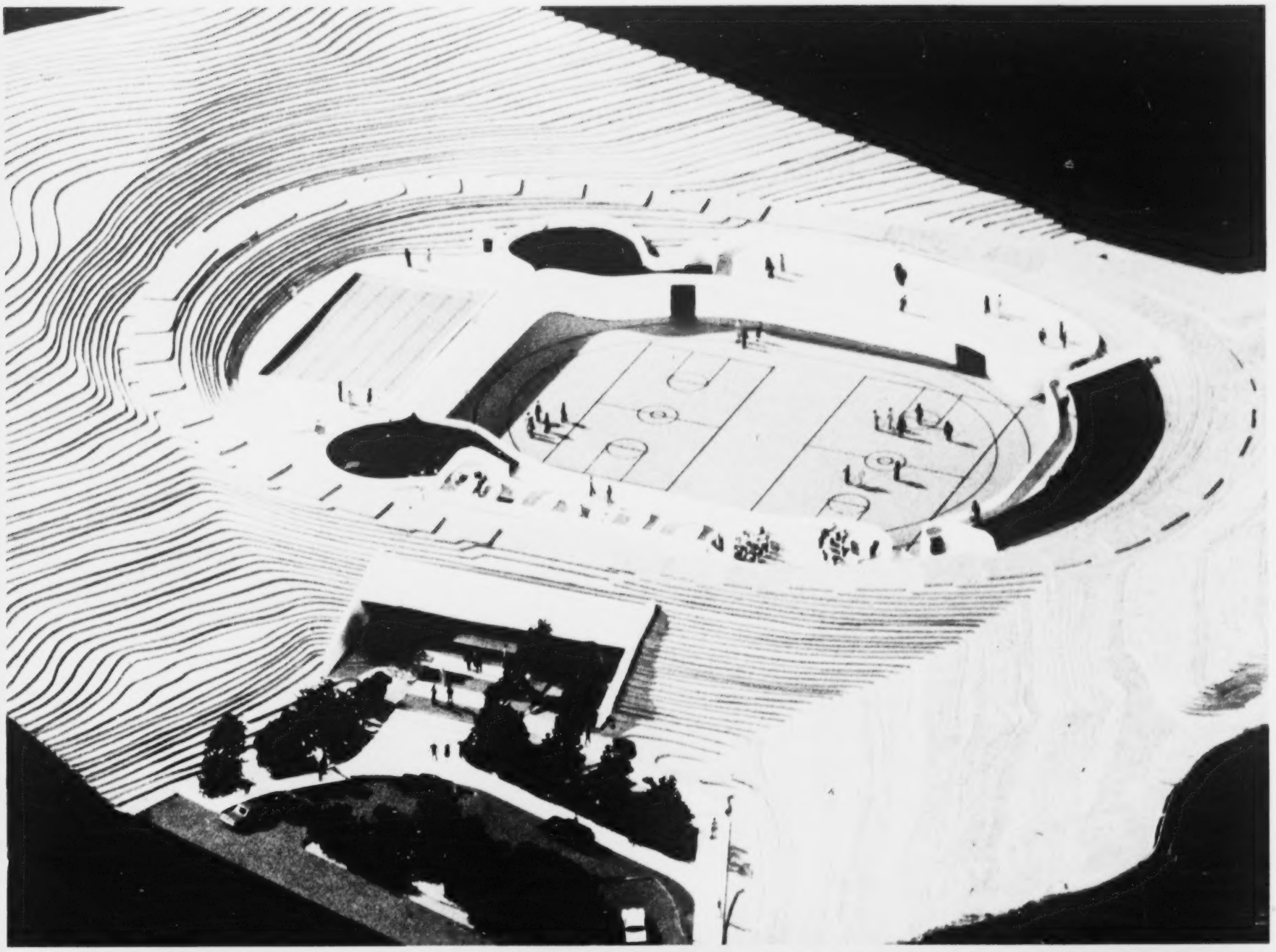


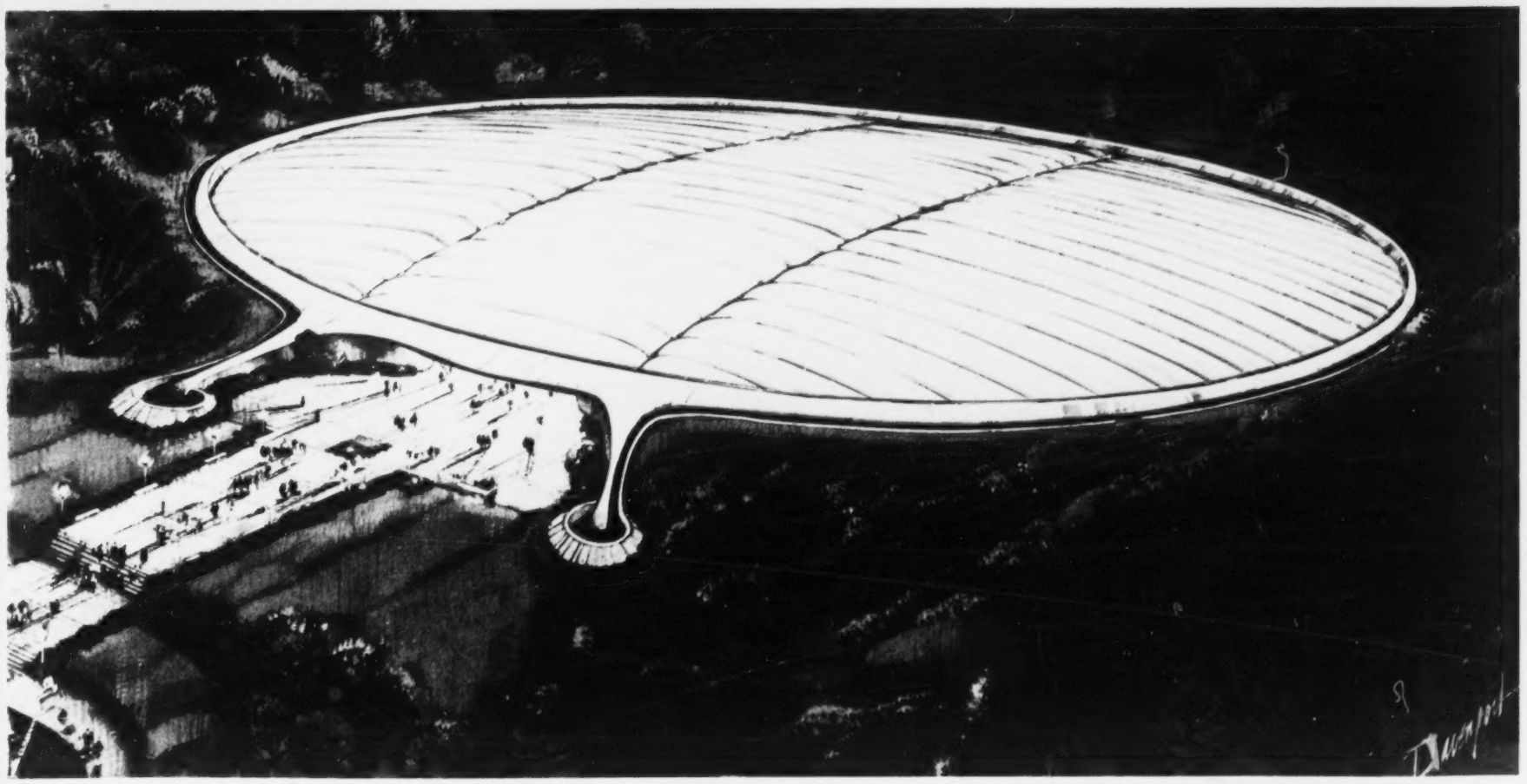
Milligan College Field House. An air-supported, cable-restrained lightweight structure is being used in Johnson City, Tennessee to provide Milligan College with a 78,000 square foot, column-free fieldhouse. The building is being constructed for approximately half the conventional cost.

The Milligan fieldhouse has a permanent, tough, synthetic "skin" less than 1/32nd of an inch thick. The site selected for the building was a natural earth valley which is complementary to the low silhouette of the structure. The site permitted the building to be designed without exterior walls, further reducing costs. This type of lightweight structure receives its primary support from air blown into the building to create internal pressure slightly greater than that outside. The cables add permanence and stability. Structural consulting engineers were David Geiger-Horst Berger, P.C. Roof design by David Geiger.



Transverse and longitudinal sections.





RELATED LIGHTWEIGHT DESIGN

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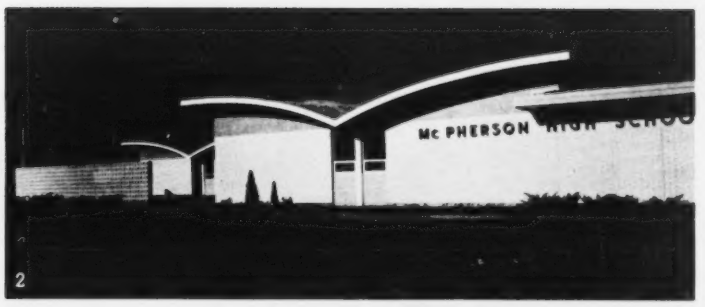

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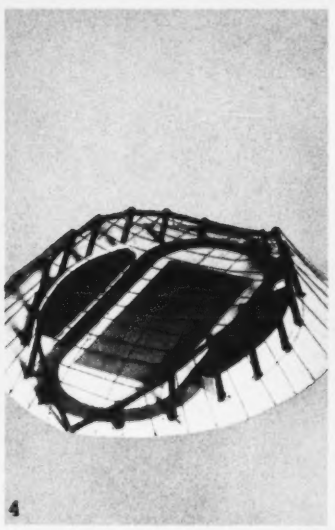
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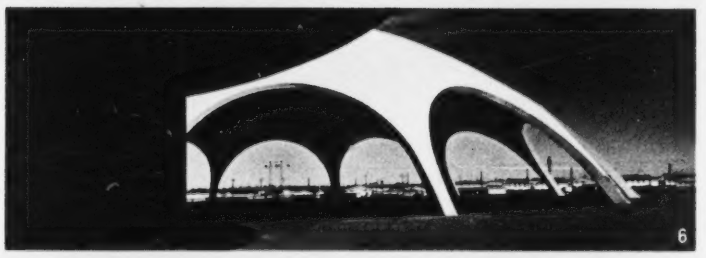
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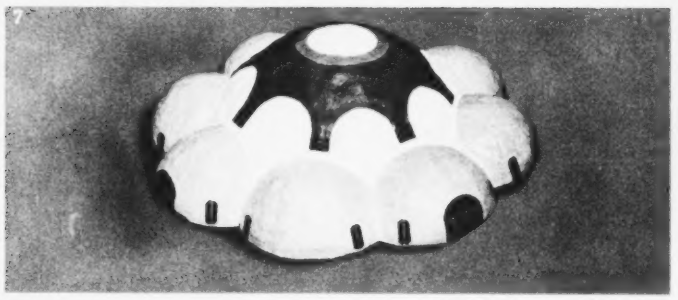
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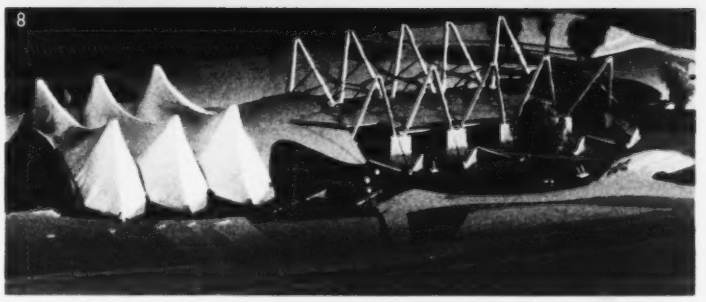
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Among other projects designed by The Shaver Partnership are: **1.** Montgomery Central High School, Clarksville, Tenn.; **2.** McPherson, Kans., High School; **3.** Playground shelter for Arrowwood Elementary School, Saginaw, Mich.; **4.** Proposed lifetime sports center, Alief, Tex.; **5.** Proposed junior high school, Las Vegas, Nev.; **6.** Sherwood Elementary School, Greeley, Colo.; **7.** Proposed student center, Glen Cove, N. Y.; **8.** Proposed elementary school, Des Moines, Iowa.

Research on many of the projects shown in this brochure was funded by Educational Facilities Laboratories, Inc.

"I should most of all like to develop the actual structure out of existence altogether, so as to get more space and energy for what should be done inside our buildings."

– FREI OTTO

The Shaver Partnership is an internationally known architectural firm with clients in 35 states and numerous overseas locations. Founded by the late Charles W. Shaver in 1915 as a one-man office, the firm now employs more than 80 persons in Salina, Kansas, and Michigan City, Indiana. Modern communications and transportation techniques are used to maintain close contact with the firm's projects.

The Shaver Partnership is responsible for $40 million of construction volume per year in its design of educational, medical, commercial, religious and residential facilities. The firm has been recognized for its innovative approaches to building design, of which the use of lightweight structures is one example.

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14